



MICHAEL A. STICHTER, Ph.D., P.E., CFEI, CVFI

PROFESSIONAL BIOGRAPHICAL OUTLINE

BACKGROUND

Dr. Stichter is a licensed professional mechanical engineer with extensive experience in automotive, recreational, transportation, agricultural, commercial and industrial equipment and systems.

He has more than twenty years of experience in industrial manufacturing engineering; including gas turbine blades and vanes coatings, box trucks, hot aerospace structures, and gas generation equipment. His experience also includes design of manufacturing operations and specialized equipment such as machine guarding for personnel safety.

He has extensive experience inspecting and commissioning industrial gas generation systems at customer sites around the world (EMEA, Asia, Australia); including metals processing, glass manufacturing, and electrical power plants. He has engineered PEM Fuel Cell stacks and balance of plant, and related testing equipment; sensors, valves, pumps, humidification, phase separation, electrical load, and control systems.

AREAS OF SPECIALTY

- Failure Investigation and Analysis of:
 - Mechanical Components
 - Electrical Components
 - Hydraulic Components
 - Control Systems
- Machine Guarding, Lock out/Tag out
- Industrial and Construction Safety
- Forensic Engineering
- Oxygen Safety
- Combustion chemistry detection, measurement, and controls
- Mechanical Engineering
- Consumer Appliance Failure
- Accident Investigation
- Battery Failure/Fire
- Codes and Standards
- Piping/Plumbing/HVAC
- Power Tools
- Laser Safety
- Hydrogen Safety
- Automobile Restoration – work quality, standards, and process

LICENSES & CERTIFICATIONS

- Licensed Professional Engineer (PE)
 - Pennsylvania, PE # PE089115; Maryland, PE # 47945; Delaware # 22096; Massachusetts # 53988; New York # 099396; Colorado # PE.0054684, New Jersey # 24GE05471500, Texas # 134597, Alabama # 38527-E
- Certified Fire and Explosion Investigator (CFEI), NAIFI# 22271-12997v
- Certified Vehicle Fire Investigator (CVFI)
- Certified Fire Investigation Instructor (CFII)
- Remote Pilot, Small Unmanned Aircraft System, FAA 4043459
- Private Pilot, ASEL, FAA 4369186
- Fork Lift Operation, Scissor Lift Operation, Aerial Lift Operation
- Bosch CDR Technician
- Certified Marine Investigator (CMI), #179 – IAMI #4304
- Diplomate in Forensic Engineering (DFE)

SUMMARY OF EXPERIENCE

Dr. Stichter's professional work experience includes:

- Electrochemistry including fuel cell and battery design and failure analysis.
- Hydrogen and oxygen gas generation and plant engineering, construction, and failure analysis.
- Palletized gas generation systems, water purification, fire safety sensors and response systems.
- Gas compression, transfer, and storage equipment; piping and high pressure storage.
- PLC and HMI for control and monitoring of industrial operations

Dr. Stichter has more than twenty years of experience in the design, manufacture, repair, and operation of passenger and high performance motorcycles and racing cars from model years 1910 until today.

His interest in automobiles inspired him to start his post-secondary education at McPherson College, in McPherson, KS, where he earned an Associate of Technology degree in Automotive Restoration Technology. This program included concentrated lab work in mechanical, body/paint, and trim restoration. He applied this hands-on experience to further education by going on to study mechanical engineering at Drexel University. While pursuing his BSME degree, he gained experience in aerospace development and manufacturing.

After earning his BSME, he joined Teledyne Energy Systems where he continued working on development projects for aerospace H₂/O₂ PEM fuel cells. He developed systems for micro- and lunar-gravity passive reactant recirculation and water separation, and controls for the fuel cell system. He also engineered, commissioned, and repaired hydrogen (and oxygen) generation plants. These systems included the hydrogen generators (by electrolysis), compressors, storage tanks, deionized water, chillers, control systems, flame and gas detectors, and interconnecting piping.

Dr. Stichter's graduate research work focused on optical diagnostics of combustion chemistry and included performing ultraviolet (uv) laser induced fluorescence (LIF) experiments studying the OH radical in the afterglow of a nanosecond pulsed plasma discharge at temperatures below the auto-ignition threshold; cavity ringdown spectroscopy (CRDS), magneto-optic rotation (MOR), and cavity enhanced magneto-optic rotation (CEMOR) experiments studying OH concentrations in a lean methane-air slot burner; and development of a novel cw-CEMOR spectroscopy system to study small peroxy radicals in a flash photolysis facility. This research is applicable to engineered products such as in flame detection and chemical concentration measurement for safety and process control.

Dr. Stichter received his Doctor of Philosophy, a Master of Science in Mechanical Engineering, and a BSME from Drexel University.

FORMAL EDUCATION

- Doctor of Philosophy in Mechanical Engineering, Drexel University
- Master of Science in Mechanical Engineering, Drexel University
- Bachelor of Science in Mechanical Engineering, Drexel University
- Associate of Technology, Automotive Restoration Technology, McPherson College

PROFESSIONAL EXPERIENCE

January 2017 – Present | ARCCA, Inc. | Senior Mechanical Engineer

- Failure analysis of automobile components and systems; piping; manufacturing equipment
- Failure analysis of mechanical devices including industrial equipment such as fork lifts and scissor lifts
- Fire investigation of vehicles, structures, batteries, etc.
- Testing and development of player safety components for NHL
- Research in failure modes of lithium-ion batteries in consumer devices; i.e. vape devices and hoverboards

September 2006 – September 2010 | Teledyne Energy Systems | Hydrogen Systems Project Engineer

- Managed and engineered hydrogen generator systems projects; design, build and test
- Commissioned and engineered retrofits for field upgrades of hydrogen generation systems from 50 slpm to 1000 slpm
- Designed and tested water separation and fluid recirculation systems for micro/zero-g PEM fuel cell systems
- Developed regenerative H₂/O₂ PEM fuel cell stack and balance of plant
- On-site investigation, repair, testing and support of fuel cell test stations
- Authored and edited Operations and Maintenance manuals for plant equipment
- Engineered control system for storage of Multi-mission Radioisotope Thermoelectric Generators (MMRTG)

April – September 2005 | General Electric – Ceramic Composite Products | Project Engineer Intern

- Engineering support for manufacturing of carbon matrix/silicon carbide fiber parts for on-orbit plug and patch repair of wing leading edge and thermal protection tiles for Space Shuttle Orbiter, used on STS-114+

September 2003 – March 2004 | Teledyne Energy Systems | Development Engineer Intern

- Designed and operated electrolysis separator material testing facility
- Operation and maintenance of PEM Fuel Cell life testing stations

September 2002 – March 2003 | Pratt & Whitney – Advanced Coatings | Manufacturing Engineer Intern

- Engineering support of advanced coating technologies for thermal protection systems including Electron Beam-Physical Vapor Deposition of ceramic and Cathodic-Arc metallic coating of turbine blades and vanes

June – September 2002 | Supreme Mid-Atlantic Corporation | Lean Manufacturing Coordinator

- Plant layout re-design for process efficiency gains through personnel safety
- Design and build machinery for truck body manufacturing
- Value Stream Mapping, 5S training

September 2000 – February 2001 | John's Motor Service | Assistant Automotive Technician

- Automotive and light truck service and repair, shop equipment maintenance

May – August 2000 | Stony Bridge Landscaping | Landscaper

- Commercial lawn maintenance and landscaping

ACADEMIC EXPERIENCE

Research Fellow: Combustion Chemistry & Optical Diagnostics, Drexel University, 2010 – 2016

Dissertation Title: Cavity Enhanced Magneto-Optic Rotation for Measurement of HO₂

PROFESSIONAL SOCIETIES

- Society of Automotive Engineers (SAE)
- American Society of Mechanical Engineers (ASME)
- American Motorcycle Association
- National Association of Fire Investigators (NAFI)
- American Society for Testing Materials (ASTM)
 - Committee for Flammability Hazards in Oxygen Systems
- Experimental Aircraft Association (EAA) – Lifetime member
- National Academy of Forensic Engineers (NAFE) – Member # 1162

SPECIALIZED COURSEWORK

Fire Hazards in Oxygen Systems, ASTM, April 2008

Combustion Energy Frontier Research Center, NSF, and Combustion Institute, June 2013

Vehicle Fire, Arson, and Explosion Investigation Science and Technology Seminar, September 2017

Accessing and Interpreting Heavy Vehicle Event Data Recorders, May 2018

PUBLICATIONS AND PRESENTATIONS

Stichter, M.; Ball, Z.; Jewell, C.; Lanning, W.; "A Nondestructive Forensic Investigation of a Scissor Lift Fatality." Journal of the National Academy of Forensic Engineers 40, no. 1 (July 9, 2023).

Stichter, M.; "Why Lithium-Ion Batteries Fail, And What to Do About It," The 10th Annual Battery Safety Summit, Alexandria, Virginia, October 22-25, 2019. Chair of Battery Fires & Investigations session.

Stichter, M.; "Anatomy of Failure - Understanding the causes of lithium-ion battery fires," CLM Magazine, The CLM, August, 2017.

Stichter, M.A.; Cernansky, N.P.; Miller, D.L.; "Continuous Wave CEMOR for Measurement of HO₂," 10th US National Meeting of the Combustion Institute at the University of Maryland April 23-26, 2017.

Stichter, M.A.; Robbins, J.R.; Cernansky, N.P.; Miller, D.L.; "Continuous Wave Cavity Enhanced Magneto-Optic Rotation Spectroscopy for Small Combustion Radicals," Poster presented at 9th US National Meeting of the Combustion Institute at the University of Cincinnati May 17-20, 2015.

Wu, L.; Lane, J; **Stichter, M.**; Cernansky, N; Miller, D; Fridman, A; "Effects of N2(v) and NO in Plasma-assisted Oxidation and Ignition Below Auto-ignition Threshold," AIAA 51st Aerospace Sciences Meeting, Grapevine, TX, January, 2013.

Lane, J.L.; **Stichter, M.A.**; Cernansky, N.P.; Miller, D.L.; "Development of a Sensitive and Selective Laser Diagnostic Technique for Measuring Paramagnetic Species," 8th US National Meeting of the Combustion Institute at the University of Utah May 19-22, 2013.

Lane, J.L; **Stichter, M.A.**; Cernansky, N.P.; Miller, D.L.; "A Flash Photolysis Facility for Fundamental HO₂ Studies," 8th US National Meeting of the Combustion Institute at the University of Utah May 19-22, 2013.

Lane, J.L.; **Stichter, M.A.**; Cernansky, N.P.; Miller, D.L.; "Selective Observation of the Anomalous Zeeman Effect Using Magneto Optic Rotation," Fall Technical Meeting of the Eastern States Section of the Combustion Institute at the University of Connecticut, October, 2011.

Stichter, M.A.; Ibrahim, S.; "Hydrogen Generation from Electrolysis," Teledyne Energy Systems, Inc. DOE/GO/13028-001, 2008.



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www.arcca.com

2023

To Whom It May Concern:

Dr. Michael Stichter's rate schedule is as follows:

- \$325/hour for file review/analysis
- \$375/hour for testimony

If you should have any questions or concerns, please feel free to contact me.

Thank you for choosing ARCCA.

Sincerely,

Gretchen Karpchuk

Gretchen Karpchuk
Project Manager
gkarpchuk@arcca.com



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August 14, 2023

Kyle Voss, Esquire
Brown Pruitt Wambsganss Dean Forman & Moore, P.C.
201 Main Street, Suite 700
Fort Worth, TX 76102

Re: ***Georgiou, Constantino vs. Shore Power, Inc. d/b/a Battery Junction; LG Chem, Ltd., Shenzhen IMR Technology Co., Ltd. d/b/a Imren and Does 1-50***
No.: 4:21-CV-00418-O
ARCCA File No.: 6482-001

Dear Mr. Voss:

Thank you for the opportunity to participate in the above-referenced matter. You retained ARCCA, Inc. to investigate a claim of an 18650-size lithium ion battery emitting flames and causing burns to Constantino Georgiou. I have reviewed the documents provided and I am offering the following preliminary opinions based upon the information currently available to ARCCA. However, I reserve the right to amend or supplement these opinions as new information becomes available.

The opinions presented in this report are based on my analysis of the materials currently available to me using methodologies which are generally accepted by the scientific and engineering communities¹. The opinions are also based on my education, background, knowledge, and experience. I have Bachelors, Masters, and PhD degrees in Mechanical Engineering from Drexel University. I am a licensed Professional Engineer. I am a member of the National Academy of Forensic Engineers, and the American Society of Mechanical Engineers. I specialize in the investigation, evaluation, failure analysis, and testing of automotive, recreational, consumer, commercial, and industrial equipment and mechanical systems.

Throughout this report I refer to Battery Junction interchangeably with Shore Power.

Background:

According to the available information, on December 8, 2018, Constantino Georgiou purchased a bundle of four (4) LG HG2 INR 18650 batteries from Battery Junction's website for delivery to his residence. These batteries were produced by LG Chem, Ltd. and IMR Technology Co. Ltd. subsequently sold these batteries to Battery Junction for their distribution.

On or about March 17, 2019, Mr. Georgiou was walking into a Kohl's Department store located in Southlake, Texas. Mr. Georgiou had the subject battery present in his pocket, and felt a sudden, searing pain in the area of his upper leg. Without warning, orange flames engulfed Mr. Georgiou's leg and torso. He removed the battery from his pocket with his hands, and successfully extinguished the flames.

The Southlake Police Report regarding the incident denotes that the battery was not in any sort of e-cigarette device at the time of the incident and indicates that a dime was in Mr. Georgiou's pocket at the time of the combustion.

¹ Liptai, Laura L. "Forensic Engineering and the Scientific Method." Journal of the National Academy of Forensic Engineers 26, no. 1 (January 1, 2009). <https://doi.org/10.51501/jotnaf.v26i1.711>.

Kyle Voss, Esquire

August 14, 2023

Page 2



Materials Reviewed:

Documents and evidence reviewed by ARCCA to assist in the investigation of this matter include, but are not limited to, the following:

- Plaintiff's Third Amended Complaint for Damages, dated June 9, 2022.
- Defendant Shore Power, Inc.'s Answer and Affirmative Defenses, dated December 29, 2022.
- Initial Discovery Documents, Bates stamped SHORE POWER 00001-00077.
- Publicly available literature, including, but not limited to, the documents cited within the report, learned treatises, text books, and engineering and scientific standards

Inspections:

An inspection was requested for the incident battery, spare batteries, contents of pockets, and the clothing involved in the incident. At the time of authoring this report, no such inspection has been scheduled.

Review of Documents:

Defendant Shore Power, Inc.'s Answer and Affirmative Defenses, December 29, 2022:

- Constantino Georgiou purchased the subject bundle of four (4) LG HG2 INR 18650 3000mh 2.7V unprotected high-drain 20A lithium manganese flat top batteries from Battery Junction's website for personal use on December 8, 2018 (pg. 1-2).
- Defendant believes it is entitled to a presumption against liability under Section 82.008(a) and (c) of the Texas Civil Practice and Remedies Code (pg. 17).
- Defendant claims that Plaintiff failed to allege the availability of a reasonable and safer feasible alternative design for the subject product (pg. 17).
- Defendant alleges that Plaintiff failed to preserve the subject product in its immediate post-incident appearance, condition, and function (pg. 17-18).
- Noting the time between the purchase of the batteries and the subject incident, Defendant alleges the possibility of modification, alteration, poor maintenance, or the batteries not being used as intended (pg. 18).
- Defendant notes that there is an assumption of risk where Mr. Georgiou knowingly consented to dangerous activity, leading to the damages (pg. 19).

Discovery Documents, SHORE POWER 00001-00077:

- Subject batteries' sales receipt, confirming order of 4 x LG HG2 INR 18650 lithium Manganese batteries from Battery Junction (pg. 41).
- Website listing by Battery Junction states "[batteries] are very sensitive to charging characteristics and may explode or burn if mishandled" (pg. 43).
- Battery box states "battery may explode or catch fire if mistreated" (pg. 49).
- Battery box states "Please do not keep your battery in a pocket, purse, or other receptacle containing metal objects to avoid short circuit" (pg. 49).

Kyle Voss, Esquire

August 14, 2023

Page 3



- Battery box has graphic and text warnings, stating “To avoid serious injury and burns, always keep batteries away from contact with metals, and keep in a plastic case” (pg. 50).
- LG Chem Ltd.’s website warns of risk of disfiguring fire/explosion injury (pg. 65).

Discussion:

Performance and safety standards

The International Electrotechnical Commission (IEC) has standards for the performance² and safety³ of rechargeable lithium ion batteries. Underwriters Laboratories (UL) and Japanese Standards Association (JSA) also have safety standards^{4,5} for rechargeable lithium ion batteries. There is no evidence available at present that the subject LG HG2 batteries sold by Battery Junction do not meet these standards.

There is no evidence that Battery Junction participated in the formula or design of the battery cells or their packaging or labeling, nor did they modify the formula or design of the battery cells or packaging or labeling as was received from the distributor and sold to Mr. Georgiou.

Known failure modes

Thermal runaway is a term which is used to describe the process occurring in a lithium ion battery where the temperature rises at a faster rate than the heat can be transferred away from the battery cell by conduction, convection, and radiation. This temperature rise causes further internal damage and the heat transfer from a battery cell in thermal runaway can cause thermal injuries to people and property including causing nearby battery cells to also go into a state of thermal runaway.

Cylindrical lithium ion battery cells, such as the subject LG HG2 18650 model, can be caused to go into a state of thermal runaway by external and/or internal short circuiting and also mechanical and/or thermal abuse. The history of the subject battery cells is unknown. Dropping the subject battery on the ground is a form of mechanical abuse. It is unknown at present if any of the subject battery cells have been dropped or if they have been exposed to temperature extremes, whether low temperature or high temperature. Either temperature extreme can cause internal damage which is invisible to the user.

A key or coin in a pocket can provide an external conductive path of low resistance and provides an uncontrolled high current draw to the battery. This high current draw causes internal damage which can build up over time by repeated occurrences which can lead to internal short circuiting which progresses to thermal runaway. This type of occurrence is well known.

The box that individual LG HG2 batteries are shipped in contains warnings that include the phrases, “battery may explode or catch fire if mistreated,” and “Please do not keep your battery in a pocket, purse, or other receptacle containing metal objects to avoid short circuit.” The packaging also states, “To avoid serious injury and burns, always keep batteries away from contact with metals, and keep in a plastic case.” These labels provide warnings of dangerous conditions when abused or mistreated and instruction on how to avoid serious injuries.

There is no evidence that any warning or instruction provided by Battery Junction was inadequate or that Battery Junction made any false representation concerning the battery.

² IEC 61960-3:2017

³ IEC 62133-2:2017+AMD1:2021

⁴ UL-1642, 5th Edition

⁵ JIS C 8715-2

Kyle Voss, Esquire

August 14, 2023

Page 4



Conclusions:

Based on my education, training, and experience, and a review of the available information and the preceding analysis, I conclude with a reasonable degree of engineering certainty that:

- On December 8, 2018, Constantino Georgiou purchased a bundle of four (4) LG HG2 INR 18650 batteries from Battery Junction's website for delivery to his residence. These batteries were produced by LG Chem, Ltd. and IMR Technology Co. Ltd. subsequently sold these batteries to Battery Junction for their distribution.
- The subject battery cells and their individual cell packaging boxes were not altered by Battery Junction from the battery cell distributor when sold to Mr. Georgiou.
- Battery Junction did not participate in the formula or design of the subject LG HG2 18650 battery cells or their packaging or labeling.
- There is no evidence available at present that the subject LG HG2 batteries sold by Battery Junction to Mr. Georgiou do not meet the international performance and safety standards for rechargeable lithium ion batteries.
- There is no evidence that any warning or instruction provided by Battery Junction was inadequate or that Battery Junction made any false representation concerning the battery.

The preceding analysis is based on information currently available and I reserve the right to revise and/or supplement these opinions upon review and analysis of any additional information.

Respectfully Submitted,

A handwritten signature in black ink that reads "Michael A. Stichter, Ph.D., P.E."

Michael A Stichter, Ph.D., P.E.

***DEPOSITION and TRIAL LIST for
Michael Stichter, Ph.D., P.E.***

No	Case/Venue	Testimony/Date
1.	George Stoner vs. Penn Kleen, Inc., et al. Court of Common Pleas of Adams County, Pennsylvania Docket no.: 15-S-16	Trial September 7, 2017
2.	Bradley Spalding v. Allegheny Technologies, Inc. Commonwealth of Kentucky Department of Workers' Claims Claim no. 201790651	Deposition November 7, 2017
3.	Harleysville Preferred Insurance Company vs. East Coast Painting & Maintenance LLC, Rukh Enterprises, Inc., Marcelo De Jesus, Admiral Insurance Company, and Arch Specialty Insurance Company. United States District Court for the District of New Jersey Civil Action: 2:16-cv-08603-SDW-LDW	Deposition February 11, 2019
4.	Commonwealth of Pennsylvania vs. Vize Rogers Pennsylvania Court of Common Pleas, Philadelphia County Docket no.: CP-51-CR-0002752-2018	Trial March 11, 2019
5.	Ivis Palencia vs. Prater Industries, Dentech Incorporated AND Dentech Incorporated vs. Tekni-Plex Inc. Superior Court of New Jersey Law Division – Union County Docket No. UNN-L-615-17	Deposition May 22, 2019
6.	Soriba Traore v. Tire Experts, Inc. In the District Court of Maryland for Prince George's County Case no.: 0502-0038684-2018	Trial August 15, 2019
7.	State of New York v. Amber L. Roche In the Herkimer County Court	Trial June 22, 2021
8.	Rahul Telang and Ashwini Gandhe v. NVR, Inc. t/d/b/a Ryan Homes In the United States District Court for the Western District of Pennsylvania Case no.: 2:19-cv-01025-WSH	Deposition June 28, 2021
9.	Charles Connolly & Donna Connolly v. Givaudan Fragrances Corp a/k/a Givaudan Roure Corp; Peoplelink llc d/b/a Elite Personnel Corp.; And Crown Equipment Corp. Superior Court of New Jersey Docket no.: WRN-000267-19	Deposition February 9, 2022
10.	Aimee Nicole Natapu, et al v. Caterpillar, Inc. In the Second District Court of Nevada for Washoe County Case No. CV19-01681	Deposition September 2, 2022
11.	Aimee Nicole Natapu, et al v. Caterpillar, Inc. In the Second District Court of Nevada for Washoe County Case No. CV19-01681	Trial September 22, 2022

12.	Michael Neverdousky v. Liberty Park Raceway, LLC d/b/a RPM Raceway Superior Court of Connecticut, District of Fairfield at Bridgeport Case No. FBT CV 19 6091358 S	Deposition October 27, 2022
13.	Paxton, Kenneth and Kathryn Hartley, as Next Friend of Alex Reed Paxton, deceased, and as Administrator of the estate of Alex Reed Paxton v. Georgia Power Company United States District Court, Middle District of Georgia, Columbus Division Case No. 4:22-CV-00081	Deposition May 12, 2023
14.	Karen Schneider, et al. v. Albino Isaac-Lim, et al. Circuit Court for Baltimore County, Maryland Case No. C-03-CV-22-002369	Deposition July 28, 2023

This Deposition and Trial List complies with Federal Court Rule 26(b).

Dr. Michael Stichter has not been disqualified as an expert witness.

Dr. Michael Stichter is a salaried employee of ARCCA, Incorporated.